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КОНФЕРЕНЦИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ
ПО ВОПРОСУ О ПРИМЕНЕНИИ НАУЧНЫХ И ТЕХНИЧЕСКИХ ЗНАНИЙ
ДЛЯ УДОВЛЕТВОРЕНИЯ ПОТРЕБНОСТЕЙ МЕНЕЕ РАЗВИТЫХ РАЙОНОВ

ПУНКТ ПОВЕСТКИ ДНЯ: B.5

СССР

ОРГАНИЗАЦИЯ ТЕХНИКИ БЕЗОПАСНОСТИ И ОХРАНЫ ТРУДА НА ПРЕДПРИЯТИЯХ СССР

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Документы, составленные для Конференции Организации Объединенных Наций по вопросу о применении научных и технических знаний для удовлетворения потребностей менее развитых районов, служат в качестве рабочих документов для этой Конференции. Они опубликованы в том виде, в каком были представлены их составителями, и их содержимое и выраженные в них мнения принадлежат их составителям (см. примечания на оборотной стороне).

ПРИМЕЧАНИЯ

1. Документы, включенные в число материалов, принятых для обсуждения на общих сессиях, будут в распоряжении делегатов Конференции на следующих официальных языках Организации Объединенных Наций: русском, английском, испанском и французском.

2. Документы, включенные в число материалов, принятых для обсуждения на специализированных сессиях, будут в распоряжении делегатов Конференции только на одном из этих официальных языков.

3. Резюме всех документов в том виде, в каком они были представлены их составителями, будут в распоряжении делегатов Конференции на следующих официальных языках Организации Объединенных Наций: русском, английском, испанском и французском.

4. До открытия Конференции документы и резюме не будут выпущены для общего распространения. Они будут опубликованы заблаговременно только в ограниченном числе экземпляров и исключительно для правительственных делегаций и других правомочных участников. Последующие опубликование и рассылка трудов Конференции будут обеспечены в соответствии с практикой Организации Объединенных Наций, как это установлено ее Издательским комитетом.

ОРГАНИЗАЦИЯ ТЕХНИКИ БЕЗОПАСНОСТИ И ОХРАНЫ ТРУДА НА ПРЕДПРИЯТИЯХ СССР

М.Г. Клюев.

1/ Вопросам охраны труда и техники безопасности в СССР всегда уделялось большое внимание.

Еще в тяжелые годы становления советской республики была выдвинута задача коренного изменения и облегчения условий труда рабочих на предприятиях, оставшихся в наследие от царской России.

Специальным декретом от 18 мая 1918 г. была учреждена государственная инспекция труда, в задачу которой входило осуществление контроля за проведением в жизнь декретов, постановлений и других актов советской власти в области охраны труда и непосредственное принятие мер по обеспечению безопасности жизни и здоровья работающих.

Вопросы охраны труда нашли законодательное закрепление уже в первом Кодексе законов о труде, принятом в 1918 г. Впоследствии Кодекс законов о труде постоянно совершенствовался.

В ныне действующем Кодексе Законов о труде значительно расширены нормы по охране труда.

В Кодексе предусматривается, что "ни одно предприятие не может быть открыто, пущено в ход или переведено в другое здание без санкции инспекции труда и органов санитарно-промышленного и технического надзора"/ст.138/.

Этот Кодекс требует от руководителей предприятий и учреждений устранения вредных условий труда, предупреждения несчастных случаев /ст. 139/. Согласно ст. 36 Кодекса администрация не может требовать от рабочих и служащих работы, сопряженной с явной опасностью для жизни или не соответствующей законам о труде. Предусматривается предоставление работающим на вредных работах дополнительных льгот: спецодежды и средств индивидуальной защиты, спецпитания /ст. 141/. Эти категории работников пользуются сокращенным рабочим днем и дополнительным отпуском /ст. 95 и 115/.

Во вредных производствах предусмотрен обязательный предварительный осмотр поступающих на работу, а также периодическое их освидетельствование /ст. 143/.

Кодекс определяет порядок надзора за выполнением законодательных актов по охране труда /ст.ст.146,147/.

2/ Улучшение условий труда, устранение причин производственного травматизма и профессиональных заболеваний рассматриваются в Советском Союзе как государственная задача, вытекающая из Конституции, где закреплено право на труд, отдых и материальное обеспечение в старости, а также в случае болезни и потери трудоспособности.

Конституцией СССР гарантируются также равные права женщин на труд, оплату труда, отдых, социальное страхование и образование.

Для осуществления мероприятий, направленных на улучшение условий труда рабочих, широкого внедрения новых достижений в области промышленной вентиляции и освещения и других мероприятий по охране труда Советское правительство выделяет ежегодно огромные средства. Толь-

ко по коллективным договорам за 1956-1961 г.г. на эти цели было израсходовано 6 млрд. руб./в новом масштабе цен/.

Дальнейшее улучшение условий труда в СССР базируется на широкой электрификации производства, использовании достижений науки и техники во всех отраслях народного хозяйства, внедрении совершенной технологии, планомерной замены ручного труда механизированными и автоматизированными процессами и применением на всех предприятиях современных средств техники безопасности и санитарно-гигиенических мероприятий.

Предусмотренное семилетним планом развития народного хозяйства СССР на 1959-1965 гг. широкое внедрение комплексной механизации производственных процессов, способствует не только росту производительности труда, но и одновременно решает задачу коренного улучшения условий труда, уменьшения травматизма и профессиональных заболеваний. Изменяется самый характер труда, создаются условия для сокращения рабочего дня и высвобождения дополнительного времени для повышения культурно-технического уровня трудящихся.

3/ Требования охраны труда, закрепленные в законодательстве, базируются на научной основе, что обеспечивается большим масштабом научных исследований, проводимых как специализированными институтами системы профсоюзов, так и институтами гигиены труда и профессиональных заболеваний, подчиненными Министерству здравоохранения, а также отраслевыми технологическими институтами.

Шесть институтов охраны труда, подчиненных профсоюзам, разрабатывают эффективные методы вентиляции и очистки воздуха производственных помещений от пыли и газов, мероприятия по борьбе с избыточным теплом, шумом и производственным травматизмом, рациональные нормы и системы искусственного освещения.

Институты занимаются также изысканием новых видов индивидуальных средств защиты, тканей и конструкций спецодежды для рабочих, составлением методик и конструированием контрольно-измерительных приборов для проверки состояния воздушной среды в цехах.

Так, например, Московский институт имеет 11 лабораторий, оснащенных современной экспериментальной аппаратурой и располагает квалифицированными кадрами инженеров, техников и врачей-гигиенистов. Для реализации результатов научных исследований институт имеет также специальное конструкторское бюро, в котором разрабатываются технические проекты и опытные образцы устройств и приборов по охране труда.

Научные исследования институты проводят как в своих лабораториях, так и непосредственно на промышленных предприятиях, что позволяет выполнять научные эксперименты в реальных производственных условиях.

В области глубокого изучения профзаболеваний и профессиональной патологии работают 14 специальных институтов гигиены труда.

Институты охраны труда совместно с институтами гигиены труда и профзаболеваний разработали и научно обосновали санитарные нормы проектирования производственных предприятий; нормы естественного и искусственного освещения; основы проектирования и конструирования новых, более эффективных вентиляционных устройств и разработали

многие другие нормативы, являющиеся основными руководящими материалами по охране труда при проектировании, реконструкции и эксплуатации предприятий.

Отраслевые научно-исследовательские технологические институты при решении технологических проблем обязательно предусматривают обеспечение безопасных и здоровых условий труда.

В высших и средних специальных учебных заведениях имеются кафедры гигиены труда и техники безопасности, которые ведут большую научно-исследовательскую работу в этой области.

Результаты научных исследований широко используются на промышленных предприятиях, публикуются как в специальных, так и в популярных изданиях.

4/ В целях обеспечения требований охраны труда, предусмотренных законодательством, во всех министерствах, ведомствах, советах народного хозяйства имеются отделы по технике безопасности, ведущие работы в области охраны труда.

В функции этих отделов входит: проведение мероприятий по улучшению охраны труда, техники безопасности и производственной санитарии на предприятиях и в организациях Совнархоза; контроль за соблюдением законодательства, правил и норм по охране труда; подготовка проектов и распоряжений совнархоза, инструкций и правил по технике безопасности; организация обмена опытом работы по технике безопасности между предприятиями совнархоза; участие в рассмотрении тематических планов научно-исследовательских институтов; организация курсов и семинаров по технике безопасности для инженерно-технических работников предприятий.

Отдел имеет право проверять состояние техники безопасности на предприятиях, приостанавливать работу на отдельных производственных участках в случае непосредственной угрозы жизни и здоровью работающих.

Непосредственная работа по созданию безопасных и здоровых условий труда проводится на предприятиях. Основной правовой формой планирования охраны труда на предприятиях служат соглашения по охране труда, являющиеся составной частью коллективных договоров, ежегодно заключаемых совместно администрацией и комитетом профсоюза.

В соглашениях по охране труда предусматривается проведение конкретных мероприятий по улучшению условий труда; внедрение комплексной механизации и автоматизации на тяжелых и трудоемких работах; внедрение передовой технологии и средств защиты; поддержание образцового порядка и чистоты в цехах и на территории предприятия; повышение эффективности работы вентиляционных установок и снижение запыленности и загазованности воздуха в цехах; улучшение освещенности рабочего места; снижение производственного шума; обеспечение рабочих санитарно-бытовыми устройствами в соответствии с утвержденными нормами и др.

Администрация обязана осуществлять мероприятия по технике безопасности и производственной санитарии, инструктировать рабочих безопасным приемам труда, снабжать питьевой водой, оборудовать умывальники и гардеробные, выдавать спецодежду, предохранительные приспособления и т.д.

Общее руководство постановкой работы по охране труда на предприятиях возложено на главных инженеров. В зависимости от об"ема работы при главном инженере организуется отдел техники безопасности или выделяется специальный работник /инженер/.

Назначение и увольнение инженеров по технике безопасности администрация может производить только по согласованию с Совнархозом и фабрично-заводским комитетом профсоюза.

Отделы /инженеры/ по технике безопасности организуют разработку мероприятий по созданию безопасных условий труда, принимают непосредственное участие во внедрении более совершенных конструкций ограждающих и предохранительных устройств, занимаются перспективным и текущим планированием мероприятий по технике безопасности и производственной санитарии, участвуют в приеме в эксплуатацию нового оборудования, разрабатывают инструкцию по безопасным приемам труда для отдельных профессий.

Отделы техники безопасности имеют право давать руководителям цехов указания об устранении недостатков, запрещать работу на отдельных производственных участках, агрегатах, в условиях явно опасных для жизни и здоровья работающих.

В целях обеспечения безопасных условий труда и предупреждения случаев производственного травматизма и профессиональных заболеваний все поступающие рабочие обязательно проходят вводный инструктаж по технике безопасности, а также инструктируются и обучаются безопасным приемам работы непосредственно на рабочих местах. Для рабочих, обслуживающих сложные агрегаты, установки и механизмы, на предприятиях организуются специальные курсы.

Для инженерно-технических работников проводятся периодические курсы повышения квалификации в области техники безопасности.

5/ Для лечебно-профилактического обслуживания рабочих предприятий имеются медико-санитарные части, в которые входят поликлиника, амбулатория, диспансер, стационар, здравпункт, детские ясли и т.п. учреждения.

Основной задачей медико-санитарных частей является разработка и проведение совместно с санэпидстанцией мероприятий направленных на оздоровление условий труда и быта, предупреждение и снижение общей и профессиональной заболеваемости и травматизма, организации и обеспечения квалифицированного лечения.

Медико-санитарные части организуются при промышленных предприятиях с числом работающих от 4000 человек, а при предприятиях угольной, нефтеперерабатывающей, горнорудной и химической отраслей промышленности - с числом работающих от 2000 человек.

Типовой цеховой участок организуется из расчета обслуживания 1000 рабочих.

6/ Контроль за соблюдением безопасности труда осуществляется государственными и общественными организациями.

Советское законодательство требует, чтобы машины были снабжены ограждениями, предохранительными приспособлениями, блокирующими устройствами и другими элементами безопасности. Поэтому контроль за обеспечением этих требований начинается со стадии проектирования. Разработ-

ка, изготовление и испытание опытных образцов новых машин, оборудования, приборов и других изделий машиностроения и передача их в серийное производство находится под контролем органов Госгортехнадзора, Энергонадзора, технической инспекции профсоюза и Госсанинспекции.

Для надзора за соблюдением правил безопасности на действующих и строящихся предприятиях горной промышленности и на горных и буровых работах в геологоразведочных экспедициях и партиях, а также для надзора за соблюдением правил изготовления и эксплуатации паровых котлов, сосудов, работающих под давлением, трубопроводов для пара и горячей воды, подъемных сооружений при Советах министров союзных республик организованы государственные комитеты по надзору за безопасным ведением работ в промышленности и горному надзору.

Эти комитеты издают по согласованию с профсоюзами правила по технике безопасности, обязательные для предприятий всех отраслей промышленности.

При главном управлении газовой промышленности существует специальная газовая инспекция, ведущая надзор за безопасным состоянием газового хозяйства в СССР. Она имеет право производить обследование объектов, давать обязательные для предприятий предписания об устранении дефектов оборудования.

За состоянием и правильной эксплуатацией промышленными предприятиями электрического и теплоизолирующего оборудования следит государственная инспекция по промышленной энергетике и энергонадзору.

Для ведения предупредительного санитарного надзора организована Всесоюзная государственная санитарная инспекция.

На эту инспекцию возложен контроль за соблюдением санитарно-гигиенических норм и правил при проектировании, строительстве, реконструкции промышленных предприятий, изменении промышленного профиля и технологического процесса предприятий.

На крупных промышленных объектах и строительствах имеются государственные инспекторы, подчиняющиеся непосредственно главному государственному санитарному инспектору.

В случае нарушения установленных санитарно-гигиенических норм и правил инспекторы могут приостанавливать строительство отдельных сооружений, ставить перед руководителями предприятий вопрос о привлечении виновных должностных лиц к дисциплинарной ответственности, налагать денежные штрафы, возбуждать перед органами прокуратуры вопрос о привлечении виновных к уголовной ответственности.

Инспектор имеет право посещать предприятия и учреждения, требовать предъявления материалов и документов, необходимых для выяснения санитарного состояния соответствующего объекта.

Большие права в области надзора предоставлены в СССР также профсоюзам.

Механическая инспекция Советов профсоюзов, имеет право во всякое время дня и ночи посещать и осматривать предприятия, учреждения и организации. Без ведома инспекции не может быть открыто, пущено в эксплуатацию ни одно вновь выстроенное, оборудованное или реконструированное предприятие, цех. Технический инспектор имеет пра-

во приостанавливать работу на отдельных производственных участках, станках, машинах и другом оборудовании в тех случаях, когда работы могут привести к травмированию или заболеванию работающих.

Предписания технического инспектора об устранении нарушений законодательства об охране труда, правил и норм по технике безопасности и производственной санитарии обязательны для администрации предприятий, строительств.

За нарушение трудового законодательства, правил и норм техники безопасности и производственной санитарии, невыполнение в срок оздоровительных мероприятий, предусмотренных коллективным договором или вытекающих из предписаний технического инспектора, он имеет право штрафовать виновных, ставить вопрос об отстранении их от работы или о наложении на них взысканий перед соответствующими организациями, вплоть до привлечения к уголовной ответственности.

В обязанности технического инспектора входит регулярный контроль за соблюдением законодательства, наблюдение за тем, чтобы ко времени пуска вновь строящихся объектов были полностью выполнены работы по технике безопасности и производственной санитарии.

Технический инспектор расследует причины смертельных несчастных случаев и аварий, дает по ним заключение.

Кроме указанного надзора за состоянием охраны труда на предприятиях осуществляется массовый общественный контроль комиссиями по охране труда и общественными инспекторами, избираемыми на собраниях рабочих и служащих.

Комиссии организуются комитетами профсоюзов /фабричными, заводскими, местными/ из числа передовых работников, пользующихся авторитетом среди рабочих и служащих.

Комиссии контролируют соблюдение администрацией законодательства о рабочем времени, отпусках, об охране труда женщин и подростков и др.

Наряду с контролем в задачу комиссий входит активная помощь в улучшении санитарно-гигиенических условий труда, повышения культуры производства, изучению причин производственного травматизма и принятие мер к их устранению.

Комиссии привлекают к своей работе широкий актив общественности. В настоящее время в этих комиссиях и в качестве общественных инспекторов работают свыше 1,5 млн. человек.

Роль профсоюзов не сводится только к осуществлению контрольных функций.

Им принадлежит по существу ведущая роль в улучшении условий труда.

Все проекты законодательных актов, касающиеся условий труда, обязательно согласовываются с профсоюзами.

Профсоюзы разрабатывают проекты законодательных актов и представляют их для утверждения в правительственные органы. Так центральный орган профсоюзов /ВЦСПС/ издает инструкции, правила и разъяснения по применению действующего законодательства о труде. Центральные комитеты отраслевых профсоюзов устанавливают правила и нормы по технике безопасности и промышленной санитарии, обязательные для данной отрасли производства, участвуют в разработке проектов законодательных актов о режиме рабочего времени, о нормах и сроках носки спецодежды и спецобуви, о нормах выдачи спецпитания и другим вопросам.

Опыт организации охраны труда на советских предприятиях может представить интерес для стран вступающих на путь самостоятельного экономического развития.

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CHOICE OF CAPITAL INTENSITY IN OPERATION PLANNING FOR UNDERDEVELOPED ECONOMIES

By Department of Economic
and Social Affairs,
United Nations, New York

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

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CHOICE OF CAPITAL INTENSITY IN OPERATION PLANNING FOR UNDER-DEVELOPED ECONOMIES

I. Introduction

1. Industrialisation is a phase in a country's development in which its more or less stagnant economy is transformed into a self-generating developed economy capable of ensuring high and rising levels of living to the population. There is a general agreement among economists that the conditions for industrialisation are different and much less favourable in the under-developed countries of Asia, Africa and Latin America than they were in the corresponding phase in the now highly developed countries. High rates of population growth and lower average levels of income, combined with the "revolution of rising expectations", make the process of industrialisation more difficult, as well as urgent, emphasizing the importance of a greatly accelerated pace of development in the under-developed countries.

2. Industrialisation has three inter-related, but distinct aspects. First, it connotes conscious application of science and technology to the processes of production and distribution, making a radical break with centuries old productive processes based on ancient empirical techniques handed down from one generation to another. The adoption of new productive techniques derived from the conscious application of science and technology usually entails acquisition of new skills and work habits on the part of the labour force. Second, key sectors of the economy are inter-dependent and organically linked with one another in the integrated development of the whole economy. There is a notable increase in the relative weight of the industrial sector in the economy in the course of its development and the industrial sector becomes a dynamic force in modernising other sectors of the economy by providing them with more efficient capital goods. Finally, the rates of domestic savings and capital formation have to be stepped up to the levels where they can provide for the increase in population, ensure a rise in per capita consumption and reduce the reliance on foreign grants and other "non-commercial" foreign loans. This calls forth the acceleration of the present domestic rate of saving of four to eight per cent to the level of 15-20 per cent of the national income and diversification of the economy to permit an improvement in the balance of payments position by expanding the potential for exports and promoting import substitution.

3. Industrialisation in most under-developed countries has to take place in conditions of considerable initial under-employment, scarcity of capital and acute shortage of foreign exchange resources. The problem of widening employment opportunities leading to full employment in this phase of development is important not only in terms of relieving misery, but also in terms of most efficient utilisation of the abundant factor of production in the form of labour. It is in this conext that choice of capital intensity in operational planning needs to be examined.

II. Theoretical Discussions

4. The theoretical discussion of the subject of capital intensity reveals two distinct trends; one favouring labour-intensive techniques and the other supporting capital-intensive techniques.1/ Those who prefer labour-intensive techniques focus the attention on the factor endowment of under-developed economies in the form of relative abundance of labour and scarcity of capital.

1/ The trend favouring capital-intensive techniques emerged chronologically at a stage later than the trend favouring labour-intensive techniques.

This preference is expressed in two forms: the rate-of-turnover criterion[2] and the relative social marginal productivity criterion.[3] The rate-of-turnover criterion aims at maximising the ratio of output to capital. The social marginal productivity criterion aims at maximising the social marginal productivity, i.e. maximising the output for the economy as a whole. As there is virtually no loss of alternative outputs on account of the withdrawal of labour from agriculture or drawing upon from the pool of the unemployed, the social opportunity cost of labour is considered to be nil. This criterion, therefore, means the maximisation of the social marginal productivity of capital and coincides with the rate-of-turnover criterion. Both the criteria thus aim at the maximisation of immediate output and employment through the use of labour-intensive techniques.

5. Another group of economists suggests that the rate of investible surplus created in producing a unit of output should be made the basis of the selection of capital intensity. Since workers have a high marginal propensity to consume and owners of capital (governments, corporations, and private individuals) have high marginal propensity to save, the employment of capital-intensive techniques will result in greater savings and investment, and, consequently, a higher rate of growth in subsequent periods of time [4] than that obtained by employing labour-intensive techniques. The higher rates of investment will result in greater volumes of output and employment in the long run than those that would be obtained by employing labour-intensive techniques.

6. Employment of labour-intensive techniques and consequent maximisation of immediate output and employment would lead to the maximisation of consumption in the immediate future. The use of capital-intensive technique and consequent maximisation of growth rates and outputs in subsequent periods would lead to maximisation of consumption in the later periods possibly at the expense of consumption in the immediate period. There is, in essence, a conflict between present consumption and future product. However, it is admitted that the quantitative importance of this conflict varies in relation to the degree of effective control exercised on the real wage-rate through taxation, cost price and other direct and indirect controls. Attempts have been made to find a way out of this conflict by using time discount which inevitably involves political value judgments.[5]

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[2] See Professor J. J. Polak, Balance of Payments Problems of Countries Reconstructing with the help of Foreign Loans, Quarterly Journal of Economics, February 1943 and Norman S. Buchanan, International Investment and Domestic Welfare, New York, 1945.

[3] Professor A. E. Kahn, Investment Criteria in Development Programmes, Quarterly Journal of Economics, February, 1951.

[4] See Maurice Dobb, A Note on the So-called Degree of Capital Intensity in Underdeveloped Countries, Economic Appliquée, VII (1954), No.3 and Second Thoughts on Capital-Intensity, Review of Economic Studies, Vol. XXIV; Professors Galenson and Leibenstein, Investment Criteria, Productivity and Economic Development, Quarterly Journal of Economics, August, 1955, Professor K. N. Raj, Small-Scale Industries - Problems of Technological Change, Economic Weekly (Bombay) April 7 and 14, 1956; and A.K. Sen, Choice of Techniques - An Aspect of the Theory of planned Economic Development, Oxford, 1960. A detailed discussion of this type is to be found in the United Nations Bulletin on Industrialization and Productivity, No. 1, Sales No. 58.II.B.2.

[5] A. K. Sen, Choice of Techniques, op.cit., Chapters VII and VIII.

7. There are considerable difficulties in translating these theoretical conclusions into operational planning. Statistical information required for working out time preference for consumption at different points of time is not readily available. The assumption of invariant real wage-rate during the time horizon taken into account in working out time discounts is unrealistic; for, with the growth of capital accumulation, relative prices of labour and capital are likely to change in favour of the former factor. The conclusions are based on the assumption that there will be a continuing flow of labour from overcrowded agriculture into industry without affecting the real wage-rate or without incurring considerable costs in social overhead such as housing, schools, etc. This assumption is not borne out by experience. The implicit assumption of a high elasticity of substitution among factors of production and commodities is also not justified. Finally, only two factors of production are taken into account, viz., labour and capital. This ignores the existence of such scarce factors as skilled labour or managerial skills which have also to be taken into account.

III. Estimation of Capital Intensity

8. It is necessary to distinguish two phases of an investment project, the construction phase and the operating phase (or manufacturing phase in industrial projects). A number of alternative techniques involving different combinations of labour and equipment may be available for each phase and should be taken into consideration in selecting capital intensity in each phase.6/ The collection and accessibility of these primary data are indispensable in making the choice of capital intensity in operational planning.

9. Two factors should be noted in estimating the capital intensity of projects, investment in social infra-structure and the level of utilisation of fixed capital, i.e., machinery and buildings. Efficient operation of enterprises requires, on the part of the labour force, a minimum of skills to operate machinery and equipment and habits of industrial work. This calls for a stable labour force conveniently housed near the location of enterprises. It, in turn, means investment in social infra-structure such as land reclamation, housing, schools, hospitals, etc. When calculating and comparing capital intensities involved in different techniques of production, it is necessary to take into account not only investment in machinery and installations, but also in social infra-structure. Expenditure on social infra-structure assumes considerable quantitative significance in the case of steel plants, fertiliser factories, and other projects which are built near the sources of raw materials and involve building new towns or settlements. Such expenditure may become an important item of total investment once the pool of the unemployed in the urban area is exhausted and additional labour has to be drawn from the surrounding rural areas; the larger the number of workers required in the operating phase, the greater will be the expenditure on social infra-structure. In technical language, the choice of capital intensity in the operating phase of a project has to be determined in conjunction with such factors as external economies and dis-economies.

10. As to utilization of equipment it is possible to combine different quantities of labour with a machine or a plant by means of multiple shifts, staffing in each shift, use of incentives, levels of repairs and maintenance, etc., yielding different levels of output.

6/ On a macro-economic level, the construction phases of all projects taken together constitute the construction sector while other sectors of the economy comprise the operative phases of the projects.

11. The "conservative estimates" made by one United Nations expert in India disclose that from a given fixed investment, the output and employment in hand-fed operations can range from 1.00 to 6.42 and 1.00 to 5.35, respectively, depending on the pattern of management. In semi-automatic operations, the range for output can be from 1.00 to 5.56 and for employment from 1.00 to 4.45. The following table illustrates the range of variation in this area:

Estimated Range of Possible Output and Employment from a Given Quantity of Fixed Capital in India

	Patterns of Management	Hand-Fed Operations		Semi-Automatic Operations	
		Index of Production	Index of Employment	Index of Production	Index of Employment
i)	Poorly managed one shift	1.0	1.0	1.0	1.0
ii)	Well managed with incentives, conventional staffing and one shift	1.5	1.05	1.3	1.0
iii)	Well managed with incentives, intensive staffing and one shift	1.95	1.36 to 1.53	1.43 to 1.69	1.0 to 1.3
iv)	Well managed with incentives, intensive staffing and three shifts	5.50	4.08 to 4.59	4.03 to 4.77	3.0 to 3.9
v)	Well managed with incentives, intensive staffing and three shifts and seven days	6.42	4.76 to 5.35	4.70 to 5.56	3.5 to 4.55

12. These figures indicate that depending upon management there is a wide variation in the "effective" capital intensity for the same plant and equipment. The management element should be taken into account in estimating the capital intensity of a given technique. This in turn has implications in terms of training and improving managerial skills.1/

IV. Guidelines for Choice of Capital Intensity

13. The policy making authorities have to take decisions regarding capital intensity for the individual sectors and the economy as a whole and they require some working rules or guidelines for this purpose; it is in the light of these guidelines that engineers and technologists can select techniques of production for various projects, redesign or modify plants and equipment and develop appropriate techniques of production. Some of the guidelines are briefly outlined in this section.

1/ These figures also reveal the potential of expanding output in the operating phases of existing enterprises in under-developed countries by improved management. In connection with the management aspect see: United Nations Department of Economic and Social Affairs, Division of Industrial Development, Management of Industrial Enterprises in Under-developed Countries, Sales No. 58. II.B.5.

14. The rational use of limited resources available for the industrialisation of a country requires a long-term strategy of development. This strategy should be worked out on the basis of the initial stage of development with reference to such factors as the social, economic and administrative infra-structure; size and growth rates of the population, known physical resource endowment, and present and prospective importance and structure of foreign trade. For example, India's strategy of development with her vast population (large potential market), diverse natural resources and limited potential for exports will be different from that of a country with a small population, abundance in one key exportable natural resource (e.g., petroleum and natural gas), and consequent large potential export and favourable foreign exchange position.

15. A perspective plan with goals of given increases in per capita income and consumption in a specified time limit (e.g., 100 per cent increase in per capita income and 75 per cent increase in per capita consumption in 25 years) is elaborated on the basis of the long-term strategy of development. This plan will also govern the priorities and patterns of investment among individual sectors of the economy. It provides the basis for the medium-term plans in which the rates of growth and investment are scheduled so that the specified goals are obtained in the last year of the specified time-horizon. The perspective plan is continually revised in the light of experience, achievement and changing economic circumstances. At the same time, the time-horizon of the perspective plan is being extended by the length of the completed medium-term plan.

16. The long-term strategy of development, the ensuing priorities and patterns of investment in the perspective and medium-term plans and the relationships of interdependence among sectors of economy (e.g., relation between agriculture and the industrial sector, and dependence of manufacturing industries on supplies of raw materials and power, transport facilities, trained manpower, etc.) may have to be often worked out independently of immediate employment considerations.

17. The stage has been set for selecting capital intensities once the broad outlines of the medium-term plan, including approximate targets of annual growth rates of national income, consumption and investment are determined. The most important point at this stage of elaborating the medium-term plan is to focus attention on the number of additional workers (and total number of workers) that can be employed during the plan period, rather than on the total number of existing unemployed or under-employed workers. Even assuming the availability of complementary equipment even in the most rudimentary form (say, spades and baskets), the most important limiting factor on expansion of employment is the available supply of food and other wage-goods which determine the real wage rate. The volume of employment can be increased in direct proportion to the level of the minimum real wage-rate that is politically feasible in a given situation.

18. Various direct and indirect measures of control such as tax measures (especially commodity taxes, lowering the limit of exemption from income taxes, land revenue, etc.) and "safe" limits of deficit financing (i.e. permissible increase in the general price level) and price controls and compulsory procurement of food and cloth, etc., amount, in essence, to distributing the available supply of consumer goods among the largest possible number of employed persons. Theoretically speaking, the ceiling on employment might be full employment of the entire labour force, if it is possible to achieve a sufficiently drastic cut in the real wage rate.

19. The creation of employment to the level of a "ceiling" arrived at by various considerations of economic and political nature represents the maximum utilization of labour (the abundant factor of production) which is feasible under the given circumstances, and represents the key factor in determining the capital intensity. It should be noted that such a "ceiling" embraces the labour force to be employed in all projects and sectors of the economy.

20. The feasible maximum number of additional jobs that can be created in the plan period is arrived at by substracting the existing level of employment from the "ceiling" thus obtained. The Planning Authorities may find two possible situations. The new employment that would be created by the use of the most labour-intensive techniques in every project in the plan may be less than or roughly equal to the maximum feasible number of additional jobs, or may exceed it. In the first case the decision on the choice of capital intensity is relatively easy, namely to use the most labour-intensive techniques in every project.

21. However, in most under-developed countries it is possible to undertake simple projects such as irrigation, housing, road building, etc. with the help of simple tools (say, spades and baskets). These simple tools are either already available or can be easily manufactured locally. Alternatively, they can be imported by spending a small amount of foreign exchange. Consequently, it should be possible to create new employment of this type in almost all countries unless inadequate organizing or managerial ability operates as a bottleneck in the execution of projects. Even if such a bottleneck does exist, it is possible to overcome it by training suitable personnel within a short period. Inability to create new employment in the plan period equalling the feasible maximum number of additional jobs implies a failure to fully utilize the potential resources for realizing the maximum pace of development. The first situation, therefore, is likely to be, at best, a temporary one and most under-developed countries are already likely to be found, or will be soon, in the second situation.

22. The choice of capital intensity in the second situation is a complex task requiring the selection of differing capital intensities for different projects in such a way that a new employment created by them is roughly equal to the feasible maximum number of additional jobs in the plan period. The use of the maximum capital-intensive techniques is almost certain not to fulfill this condition. It is, therefore, necessary to discover how best this possibility of differential capital-intensities can be utilized in the interests of the economy.

23. Historical evidence indicates that the cost of labour relative to capital will increase over time once accumulation of capital outruns growth in the labour force, that is, the value of equipment per worker begins to increase. This trend in most countries is reinforced by enacting of minimum wage legislation (reflecting social conscience and rising expectations), unionization of labour and a steady increase in the opportunity cost of the transfer price of labour from agriculture to other sectors of the economy 8/

8/ As workers begin to move from overcrowded agriculture to other sectors of the economy, average employment and income of the labour force retained in agriculture will increase. This, in turn, will lead to the increase in the wage-rate that will have to be offered to workers in agriculture to induce them to take up employment in other sectors of the economy.

24. This means that the labour costs, i.e. operational costs, will rise over time. This trend element should be taken into account in working out differential capital intensities for individual projects. A distinction was made earlier between two phases of an investment project, the construction phase and the operating phase (or manufacturing phase in industrial projects). The increase in the cost of labour relative to capital over time will affect only the operating phase. It is therefore preferable to use more capital-intensive or less labour-intensive techniques in the operating phase of projects than in the construction phase. In other words, the construction activities throughout the economy should receive top priority in the use of labour-intensive techniques.

25. The techniquesdesigned for the operating phase are embodied in machinery and equipment. The impact of the rise in future operating costs is in proportion to the length of time over which the machinery and equipment will continue to be in service. The relevant time-horizon comprises (i) a gestation period or the time taken up in the installation of machinery and equipment and (ii) the lifetime of machinery and equipment. The longer the relevant time-horizon (gestation period plus the life of the plant), the higher should be the capital-intensity of the techniques chosen. For example, some of the major transport installations such as railways and ports provide services for a very long period (50 years or more) and should consequently embody relatively higher capital intensity than others with a shorter time-horizon.

26. A distinction should be made between the productive operations which can be mechanized without undue additional costs at a later stage and processes whose subsequent mechanization would involve heavy additional costs. The latter should embody relatively more capital-intensive techniques than the former. This proposition is merely a corollary of the preceding proposition about a relative time-horizon.

27. Immediate cost effects of the choice of capital intensity cannot be altogether neglected. It has special relevance in mixed economies. Its maximum impact is on the enterprises manufacturing important intermediate projects and where the time-horizon of the project is long.

28. To sum up, the following guidelines should be followed in the choice of differential guidelines. First, labour-intensive techniques to the extent that it is technically and organizationally feasible should be employed in the construction phase of all projects. Second, a system of descending order of capital-intensive techniques (progressively less capital-intensive or more labour-intensive techniques) in the operative phase should be selected in (a) machine-manufacturing projects and transport installations with a long time-horizon (as defined earlier); (b) other basic industries projects producing important intermediary products and services also with a long time-horizon, and (c) all other projects. Special consideration should be given to export industries projects facing competition in the world market from developed countries. Within this system of preference in capital-intensities, productive operations in the operating phase of a project which cannot be subsequently mechanized without additional heavy costs should embody relatively higher capital-intensive techniques. The aggregate new employment generated in all projects using the above scale of capital intensities should be approximately equal to the maximum feasible number of additional jobs in the plan period.

29. Application of these guidelines will enable planning authorities, to the extent that it is possible, to select factor proportions consistent with the maximum use of labour within the given institutional and social limitations; to prevent an uneconomic structure of costs of production and losses arising from technological obsolescence; and to safeguard the position of export industries facing foreign competition.

IV. Technological Possibilities for Labour-Intensive Techniques

30. There is a general tendency in under-developed countries to employ the most up-to-date techniques in all sectors of the economy and for all types of operations. The up-to-date techniques are mostly capital-intensive because they are developed in advanced countries and are generally aimed at substituting capital for labour because of rising wage costs and increasing abundance of capital. In the first place, capital-intensive processes are often identified with "industrialization" and have a prestige appeal. Engineers often have a psychological bias in favour of such techniques because of their educational background and conscious or unconscious identification of "progress" with the latest available techniques. Business managers often prefer them in order to avoid irksome labour problems. This constellation of forces operates against the use of the economically correct factor proportions. It is, therefore, useful to draw attention to areas of industrial activities which might be usefully considered for deploying or developing capital-saving and more labour-intensive techniques.

31. There is great scope for employing labour-intensive techniques in the construction phase of all projects. At one extreme will be found almost completely manual methods of high labour intensity, including human carriers (or animal power); at the other extreme, completely mechanized operations of excavation, levelling and hauling. A number of alternative techniques which involve a wide range of different combinations of labour and equipment are thus available for construction activity.[9] Earth-moving operations, including excavation, hauling, filling and compacting are particularly adaptable to the use of highly labour-intensive techniques. The use of such techniques has, by and large, no adverse effect on the quality of the end product (houses, factory buildings, dams, canals, roads, etc.).[10]

32. Employment of labour-intensive techniques in the construction phase of all projects is also important because the unemployed and under-employed workers in under-developed countries largely form a group of unskilled workers. The study prepared by the Division of Industrial Development in the Department of Economic and Social Affairs of the United Nations [11] revealed that the share of total construction activity in incremental gross fixed capital formation in the economy is, on an average, higher in under-developed countries and varies from 46 per cent to 69 per cent in under-developed countries.[12] "Even in modern industrial countries constructional

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9/ "Capital Intensity in Heavy Engineering Construction", published in Bulletin on Industrialization and Productivity, No. 1, United Nations publication, April 1958 (Sales No. 58.II.B.2).

10/ Pyramids in Egypt and the Taj Mahal in India conclusively demonstrate this fact.

11/ "Capital Intensity in Heavy Engineering Construction", op. cit.

12/ Ibid., p. 36, see Table I in the Statistical Annex.

activity which lends itself to hand labour is as much as 50 or 60 per cent of gross fixed investment, so it is not difficult to think of labour creating capital without using any but the simplest tools."[13] The data on cost elements of earth-moving operations by different techniques are given in Table II in the Statistical Annex. It should be noted that the earth-moving operations are quite important, even in the construction of the industrial enterprises. For example, the construction of the Rourkela Steel Plant (excluding township, etc.) in India involved 6.1 million cubic metre of earthwork.[14]

33. There are a number of "technologically flexible" industries which allow for considerable substitution between labour and capital and which are therefore amenable to the use of labour-intensive techniques in the manufacturing phase. In weaving cloth, for example, there is a spectrum of techniques involving different combinations of labour and capital ranging from primitive throw-shuttle hand looms, fly-shuttle hand looms, semi-automatic hand looms, cottage power looms, factory non-automatic power looms to automatic power looms. The case of wood-working technology also falls in the same category.[15] Cotton spinning, garments, foodstuff, leather, rubber products, bricks, roofing tiles, certain chemicals, brass utensils, steel furniture, etc. are other examples of "technologically flexible" industries.

34. Manufacture of a number of goods such as radios, television sets, bicycles, agricultural equipment, etc. involve production and assembly of components. These also represent examples of "technologically flexible" industries because it is possible to organize production of components by means of labour-intensive techniques under sub-contracting arrangements and in accordance with specifications of the assembly plants. This mode of the use of labour-intensive techniques has been extensively employed in Japan. Again, labour-intensive techniques can be efficiently employed in the manufacture of accessories for the automobile industries, railways, shipping, etc.

35. The existence of the market for the second-hand machines which have become obsolescent in advanced countries on account of rising costs of labour is, in a way, an index of the scope of the "technologically flexible" industries. It may be advantageous to employ the second-hand machines in several cases first because in many cases they represent equipment of lower capital intensity and more labour-intensive techniques, and second because they permit an account of their shorter life, a more flexible equipment policy by making it possible to shift to new or different equipment at an earlier date in the future than would have been the case with new equipment.[16] Alternatively, they provide the prototype design of equipment embodying relatively more labour-intensive techniques for manufacture in under-developed countries.

36. There is a clear distinction between ancillary or auxiliary processes and "core" operations in industrial enterprises. The former consists of

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13/ Lewis, A.W., Economic Development with Unlimited Supply of Labour - The Manchester School of Economic and Social Studies, May 1954, op.cit. pp.160-161.

14/ Report of the Ministry of Steel and Fuel (Department of Iron and Steel), 1960-61, Government of India, New Delhi, 1961, p. 14.

15/ Boon, G.K., "Choice of Industrial Technology: The Case of Wood-working", March, 1960, Industrialization and Productivity Bulletin No.3, United Nations, N.Y.

16/ "Second-Hand Machines and Economic Development", Netherlands Economic Institute, Rotterdam, May 1958. Publication No. 15/58.

material handling, ware-housing, packaging, flying squads and maintenance shops for "core" operations, tool maintenance and making room, utilities, etc. It is possible to use labour-intensive techniques in some of these ancillary processes even in "technologically inflexible" industries where it is difficult to replace capital by labour in the "core" operations.

37. The attention of engineers, scientists and technicians should be drawn to the possibilities of selecting capital saving techniques in the "core" operations of the "technologically inflexible" industries. Research and development of such techniques should be undertaken where they do not exist. This can sometimes be done by designing the equipment on the basis of the process layout instead of the product or line layout especially in engineering industries. There exists a great scope of research in designing equipment and developing processes to reduce the size of operations costs with minimum increases in such costs. (In technical terms, this would amount to reducing the slope of the curve of economies of scale). This type of research has considerable importance because of the fact that in many underdeveloped countries not only the size of the present market, but also that of the potential market in the foreseeable future is likely to be relatively small.

38. Recent developments in the technology for cement production illustrate the point in case. In the beginning of the nineteenth century, cement was manufactured in vertical kilns, which presented a number of disadvantages, in particular, that of uneven burning of the clinker. Later in that century, these were replaced by rotary kilns, which improved the quality of cement and permitted large-scale production, and are still the standard equipment in the industry. In recent years, improved small-scale vertical kilns have been designed and built in Switzerland and Australia, and are being introduced in the United States. These kilns present several advantages, in particular, the fact that they can be constructed mobile. They may be especially suitable for some countries in the developing areas since they require substantially less investment per unit of output than the conventional equipment, and may thus permit the manufacturing of cement in small scale.

39. It is probable that the use of multi-purpose machinery would permit more economic operations than that of single-purpose equipment.17/ With multi-purpose equipment, the size of plant can be reduced and production of small quantities may become economic. Many plants in the less-developed countries are characterized by the use of labour-intensive processes involving short production runs of a variety of items. Market demand is not sufficient in many cases to warrant installation of specialized machinery whose capacity in any single part or product would be excessive. A development which may be of interest for plants of this type is the designing of modular units or "building block" equipment made up of standard component units which can be replaced so as to permit the use of the machinery for a variety of purposes. Modular-constructed machine-tools are particularly versatile.

40. The advantage of large-scale production over small-scale production in unit costs is derived partly from purely technological economies of scale and partly from the facilities of economic "overheads" such as research, bulk buying and selling, cheaper and easier credit facilities, advertising,

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17/ It should be noted that the use of multi-purpose machinery is technologically impractical in the chemical industry and certain other industries.

standardization of products, specialized facilities for tooling and repairs, organization of specialized maintenance staff, facilities for specialist advice, etc. The latter- facilities of "economic" overheads - can be provided to small production units by surrounding them with appropriate agencies - private, co-operative, or statutory - which can take over the functions of economic "overheads" and perform them as common services to small units. The important among these agencies are the state-sponsored industrial finance corporations, industrial extension service, sale and purchase co-operatives, industrial research institutions, corporations supplying machines on hire-purchase basis, firms specializing in tooling, repairs, etc., credit co-operatives, and so on. The chief advantage of industrial estates consists in the incorporated common services performing many of these functions of economic "overheads". Failure to distinguish between unit cost advantages arising from purely technical economies and those from other economies by engineers and technicians not infrequently results in adoption of more capital-intensive techniques than could be justified under the circumstances.

41. It should be recalled that the research in and application of the labour-intensive techniques should be organized in accordance with the guidelines on differential capital intensities in individual sectors within the framework of the average capital intensity for the economy arrived at by the planned volume of investment and the ceiling on employment.

TABLE I

Importance of Construction Expenditure in National Expenditure: Selected Countries - 1953

Country	Share of gross fixed capital formation in gross national product	Share of Construction in gross fixed capital formation	Non-Residential Construction: As percentage of total construction	Non-Residential Construction: As percentage of gross fixed capital formation	Share of Construction industry in total factor payments[a]
Industrial Countries:					
Federal Republic of Germany	20.6	47.4	-	-	6.6[b]
Netherlands	20.7	46.5	62.4	29.0	5.4
Norway[c]	29.2	50.0	54.8	27.4	8.5
United Kingdom	13.4	51.7	48.2	24.9	5.8
United States[c]	16.1	58.6	61.4	36.0	4.6
Other Countries:					
Argentina[c]	15.5	68.8	-	-	5.0
Brazil	14.2	57.5	-	-	-
Burma	14.1	76.5	-	-	2.8
Chile	9.3	60.4	46.4	28.0	3.2
Ecuador	11.1	46.3	74.6	34.5	2.9
Ghana	13.3	54.2	80.8	43.8	-
Israel	23.7	70.8	53.7	38.0	5.8
Philippines	6.8	62.1	63.2	39.2	3.3
Union of South Africa	26.5	56.1	-	-	-
Yugoslavia[d]	32.0	48.5	-	-	7.2

Source: Statistical Office of the United Nations, Statistics of National Income and Expenditure, Statistical Papers, Series H, No. 10 (January 1957). For definition of each item and national differences in coverages and definition, see source.

(a) Payments to factors of production in the construction industry as a per cent of gross domestic product at factor cost (total factor payments); for Chile, Israel and the Philippines, of net domestic product at factor cost.

(b) 1950.

(c) Government fixed capital formation excluded in part from capital formation.

(d) Gross material product; capital formation includes changes in inventories. For definition of concept of gross material product, see source.

Reproduced from Industrialization and Productivity, Bulletin 1, "Capital Intensity in Heavy Engineering Construction", p. 36.

TABLE II

Capital Intensity and Unit Costs for a Combined Operation of Excavation, Transport and Compaction

Country	Capital Input (US$ per thousand cub.metre-kilometres) (1)	Labour Input (man/hrs.per cub.metre-kilometres) (2)	Capital Labour Input Ratio (1):(2) (3)	Cost per Cub.Metre-Kilometre (US$) (4)	Wages (US$ per hr.) (5)	Year (6)
France	167	148	1.1	0.67	0.71	1958
India	190	600	0.3	0.60	0.13	1953
Poland(a)(b)	48	957	0.05	0.62	0.21	1952-1954
Union of Soviet Soc. Republics	180	158	1.2	0.67	1.04	1956

Source: Industrialization and Productivity, Bulletin No. 3, "Capital Intensity and Costs in Earth-moving Operations", p. 13.

(a) For details on exchange rate used in calculation, see Appendix II.

(b) Capital and labour inputs based on distribution of costs for entire project.

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ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item : B.3

I.L.O.

THE ROLE OF MANAGEMENT IN ECONOMIC DEVELOPMENT

By International Labour Office

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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The Role of Management in Economic Development

by

International Labour Office

1. Introduction

Economic development may be defined as a process which results in a sustained long-term increase in real national income per caput. This rise may be brought about by one or all of the following - re-allocation of economic resources, an increase in the quantity and quality of these resources and improved technology. Management in both the public and private sectors are in a position to influence these determinants.

Management has been defined as "the hierarchy of individuals who perform specified critical functions in the organisation".[1] For the purpose of this paper, "organisation" includes any organisation whose purpose is the production of goods and services for sale, irrespective of its ownership, public or private. The functions of management include the handling of uncertainty, planning, innovation, co-ordination, control and administration.

2. Management and the Determinants of Economic Development

(a) Allocation of Resources

Resources, technology and demand will determine what can be produced and sold as well as the optimum mix of products and the optimum mix of resources used in their production. Most countries fail to attain the optimum product and resource mixes, the developing countries being further from the optima in most cases than the highly developed ones.[2] This means that output can often be expanded by re-allocation of resources by direct decision or by the removal of market imperfections. As new resources become available, their allocation, whether via the market mechanism or government decision, should be to those activities which make the greatest contribution to total output. The changing availability of resources and advances in technology continually alter the optimum resource allocation pattern for a closed economy. Developments abroad complicate the picture still further for countries with a substantial foreign trade.

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[1] F. Harbison and C. A. Myers, Management in the Industrial World, (New York: Mc Graw-Hill, 1959), p.8.

[2] G. M. Meier and R. E. Baldwin, Economic Development: Theory, History, Policy, (New York: Wiley, 1957), pp. 316 - 319.
R. S. Eckhaus, "The Factor Proportions Problem in Underdeveloped Areas", American Economic Review, XLV, 4 September 1955, pp. 539 - 565.

An additional problem arises with respect to countries largely dependent on a single commodity. Diversification may be advisable to reduce the fluctuations in national income consequent on this dependence. However, a diversification programme may well re-allocate resources away from the optimum. In such cases, some form of stabilisation arrangement may be preferable to large-scale diversification.

Resource allocation is the result of decisions as to what shall be produced, how it shall be produced and what quantity shall be made. Such decisions are normally made by the managers of organisations. These decisions may be circumscribed by governmental restrictions on raw material imports, etc. or by fiscal policies designed to encourage or discourage the use of particular resources. The freedom of action of individual managers will vary from one country to another according to its particular circumstances and the degree to which its economy is controlled. The decision-maker may be the Minister of Industry, the head of a planning board, a board of directors or an owner-manager. Decisions on production and investment are allocation decisions and in many cases involve innovation and risk-taking. How good or bad these decisions are, will depend on how well the decision-makers know their job and the accuracy of the information on which they base their decisions. Reduction of uncertainty and the systematic evaluation of all the factors involved will bring resource allocation closer to the optimum. Management skill is therefore very closely connected to the problem of optimum resource allocation.

(b) Quantity and Quality of Resources

The basic economic resources are natural resources, capital and manpower; these will be discussed separately below.

(i) Natural Resources. The production process is largely one of transforming materials from the state in which they are found into the form desired by the consumer. For a given state of technology the quantity and quality of natural resources available place restrictions on the possibility of expanding output. In many cases these restrictions may be removed by surveys which expand the known sources of raw materials. Technological changes may make previously known raw materials more accessible or, more likely, make it possible to use a previously valueless material. The key point is that the actual natural resources of a country are fixed by nature but the known resources may be expanded by surveys and exploration and the uses of known resources may be widened by technical advances. These technical advances are part of the innovative function of management. Resource conservation, i.e. the most effective use of existing resources, is also a matter within the sphere of managerial control.

(ii) Capital. Output per unit of manpower tends to be directly proportional to the amount of capital used per unit of manpower. One of the principal ways of increasing output is therefore to increase the quantity of capital employed. This may or may not involve a change in technology; in many cases a change in technology which will improve the efficiency of utilisation of natural resources and manpower is only possible if capital can be increased. Domestic capital can only originate from savings, i.e. from production which is not consumed, although the savings for investment may be in the present or the future. However, the relationship between income and savings and between capital formation and economic growth is not always as simple and automatic as is often assumed.[3]

Managers are important in the process of capital formation. In the private sector they have a substantial voice in the use of profits, particularly if the managers are also the owners, in the determination of how much is distributed to the owners and how much is re-invested in the organisation. Of course, the political and economic stability of the country will have a strong influence on the magnitude of the profit and the willingness to re-invest it. The economic justification for large profits in developing economies is that it allows rapid capital accumulation through savings and investment which would be unlikely if profits were lower and the wage share of the national income was higher. (There are social arguments against this which will not be discussed here). Heads of enterprises in the public sector have less influence over the disposal of profits as these become a political issue. Nevertheless, their recommendations undoubtedly have some impact.

Capital is only meaningful when it is translated into productive equipment such as plant and machinery. Managerial knowledge and skill play a major part in determining the effectiveness with which the capital is used. An efficient management

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[3] "Quantitative Aspects of the Economic Growth of Nations: VI, Long Term Trends in Capital Formation Proportions", Economic Development and Cultural Change, IX, 4, Pt. II, July 1961, p. 56.

can obtain the same output with perhaps 50 per cent. less investment in machines than management which does not think systematically and does not employ rational processes of planning and control. The important thing is that managers should possess the skill before embarking on programmes of capital investment and not, as is often the case in developing countries, make the investment then find themselves unable to utilise it to the best advantage.

(iii) Manpower. Among the determinants of output is the size and quality of the labour force. Provided that the resources are available, output may be expanded by bringing into the employed labour force people who were previously inactive from the economic point of view. Far more important for the developing economies is the improvement of the quality of the manpower employed. Management has an important role to play in this respect. It can increase the amount of labour utilised by a given amount of capital equipment by deciding to work a second or third shift. It can contribute to the improvement of skill by providing in-plant training, by supporting vocational training institutions and apprenticeship schemes, by improving the physical conditions under which labour has to operate, and by improving the physical condition of labour by the provision of health services, meals, etc. Perhaps management's most important contribution, however, lies in its ability to improve the management component of the labour force by management training courses and executive development schemes.

(c) Technology

A given technology, by prescribing the way in which resources are combined, sets an upper limit to production per unit of input but it does not ensure the attainment of this upper limit. Changes in technology occur as the result of domestic research and invention and by "importing" technology developed overseas. Technological change can play a major part in eliminating the disparities that exist in national income per caput in different countries.

The technology used in a country for a given type of production is determined largely by managerial decision. Within the boundaries of given natural resources and available capital and manpower skills, management determines not only the production process to be used but also the effort to be put into improving the technology, either by research or by inquiries overseas to find out what processes are available.

In most industries there is a wide choice of processes and equipment ranging from specialised, automatic, capital-intensive types to much simpler and less capital-intensive types. In some cases the complex equipment is selected by developing economies more as a status symbol than for its utility. For a given capital expenditure the simpler machinery may well be capable of more output even though it involves the use of considerably more labour, not usually a scarce commodity in developing economies. In addition, skilled technicians required for maintenance and operation are likely to be in short supply and sophisticated equipment badly maintained is unlikely to operate efficiently. In choosing equipment and technology management usually has the determining voice but the choice must be made with full appreciation of all the factors involved, including the broader employment objectives of the economy as a whole.

3. Managerial Attributes Necessary for Progress

The skills of the people of a country are important in the process of development; equally important are the attitudes which determine whether existing opportunities are grasped and new ones sought. Development is encouraged or impeded according to the extent to which those who control the resources of the economy have an attitude of mind favourable to change, a breadth of outlook and a capacity for long-term thinking, and the necessary knowledge and skills.

(a) An Attitude of Mind Favourable to Change

An industrial society, the goal of most developing economies, makes demands on its members which are different from and often incompatible with those made by a traditional and predominantly agrarian society. For example, the organisation, discipline and mobility of the labour force, the purpose and scope of the educational system, the division and specialisation of labour, and the ethical and legal codes which permit impersonal business relationships are all important in an industrial society. They are unlikely to occur in an agrarian, traditional society.[4]

An industrial society imposes a discipline on the owner and manager as well as on the worker. The dependence of the entrepreneur, who is often not a technical man, on the knowledge and skills of his employees at all levels curtails

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[4] C. Kerr, J.T. Dunlop, F.H. Harbison and C.A. Myers, Industrialism and Industrial Man, (Cambridge, Mass.: Harvard University Press, 1960). Chapter 2.

his freedom of action with regard to the management of his enterprise. As industry develops he is likely to find himself having to accept the views of others, whether they be subordinate managers, technicians or workers' organisations. If industrialisation is to be successful, management must accept these changes and the sharing of some of the managerial authority. For these reasons, management must be prepared to change, both technically and with respect to the authority relationships within their own organisations.

(b) Breadth of Outlook and Long Term Thinking

It is important for the individual manager to see the economy from a comprehensive viewpoint. Without this he cannot assess the impact on his own organisation of the changes which are taking place nor can he see the influence of his own actions on the economy as a whole. Economic development is not a simple process, it is a highly complex one in which many factors interact on one another.

Development is a process which takes place over a long period of time and short-run thinking may impede its progress in the long run. A long term perspective implies a certain amount of faith in the future, it is not easily acquired when political and economic stability have been rare. It is the responsibility of government to do what it can to reduce uncertainties but management is not without its influence on government and it has a great interest in the type of stability that permits sustained economic growth. If management and other leaders of society do not make known their faith in the future and their willingness to act on it, there is little likelihood that anyone else will see any reason to do so.

(c) Necessary Knowledge and Skills

Management's ability to fulfil its function depends basically on its capacity to understand and master two elements. The first is the complex of factors, internal and external to the enterprise, which may affect its productivity, some of which may be beyond the control of the individual management, but nevertheless must be taken into account. These factors are economic, commercial, financial, technical, social and psychological and may include considerations imposed by government policy and shortages or deficiencies in material and human resources.[5]

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[5] Conclusions, Technical Meeting on Problems of Productivity Improvement in Certain Countries, (Bangalore, 1959), para. 50. Quoted in I.L.O. Raising Productivity, (Geneva: I.L.O. 1959), p. 18.

The second element is management's knowledge and understanding of management techniques such as production control, cost accounting, quality control, market research, work study, preventive maintenance, etc. By having a full knowledge of the organisation's economic, political and social environment and by skill in the use of management techniques, a systematic approach may be made. Information needed for rational decision-making may be acquired, difficulties can be seen and avoided or overcome by proper planning and the organisation's activities controlled so as to ensure the maximum benefit to its owners and to the economy. This is true of any enterprise anywhere but it rapidly becomes more important as enterprises grow larger and more complex.

There is a tendency to assume that the fact of holding a position of authority means, ipso facto, that the holder has the knowledge commensurate with it. The typical manager believes that this is true, at least in the absence of any evidence to the contrary. In a well-protected market, even a poor manager can run an organisation at a profit and even if his shortcomings are pointed out to him his attitude may well be "Why bother? I'm doing alright". In the final analysis, little can be done to improve managerial performance and through it, to achieve accelerated economic development, until the attitudes of those with the power of decision and action are transformed so that they are favourable to progress.

In management, as in other fields, experience is an important teacher but it is not the only teacher nor is it always the most efficient. The process of managerial self-improvement is going on in most industrialised countries and is undoubtedly one of the important reasons for the high level of productivity in these countries.

4. Conclusion

The role of management in economic development is that of the agent which controls in varying degrees a number of the major determinants of the level of development, in association with government - sometimes as part of it. It exercises that control in the course of managing the enterprises of the economy, public and private. Management's role in development is a major one, but it can be played actively or passively, and it can be positive or negative in its contribution to the over-all effort. The role has great potential, but its real value depends on management itself. Given the appropriate attitudes and ever improving skills, management can play a

leading role in the development process. It is certainly quite true that management is not the only important agent of development, and improving management is not the only action that must be undertaken to bring about viable growth. As one writer has metaphorically put it, "the lock which shackles the economies of underdeveloped countries will be opened not by a 'key' but by a 'combination lock' ...".[6] Management is a vital element in the combination.

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[6] R.S. Roberts, Jr., Economic Development, Human Skills and Technical Assistance; a study of I.L.O. technical assistance in the field of productivity and management development. (Geneva, Librairie Droz, 1962), p. 145.

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Agenda Item: B. 3

Ghana

TRAINING FOR MANAGEMENT : "A CO-ORDINATED NATIONAL MANAGEMENT DEVELOPMENT PROGRAM"

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TRAINING FOR MANAGEMENT

"A co-ordinated national management development program"

Prepared by: George Soloyanis, Training Specialist, Manpower Unit
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The importance of trained managerial personnel and a program for management development has been recognised in Ghana by many segments of the economy. Initially there were simultaneous efforts without much co-ordination but by 1962 there is a considerable amount of unified and controlled effort. Many agencies using the services of specialists over a wide range of administrative and executive practice, and using the leadership of the current pool of managers, have made progress towards the "institutionalization" of management training in Ghana.

2. In contrast to West African, the more mature economies can provide pools of individuals most appropriate and most apt for the training and polishing process which is management development whenever managers are needed. There is a broad educational and experiential base in the population for whom technology is not separated from ordinary living, where progress is rapidly communicated, where the implications of developing technologies are easily grasped, and above all, where the public expectation is one of change and improvement. In West Africa this background and broad support is missing, except for a growing and educated minority and as a consequence of the lack of attitudinal readiness and comprehension, management development programs perse can be mounted for only a relatively few and can in and of themselves only be successful in the short run. Management development must be planned in depth, and it must be supported by programs' calculated to strengthen many activities which are auxiliary to good management.

3. What appears in other societies to happen easily and naturally, that is, the acceptance of management as a way of thinking and of organising behaviour, is based on the accumulated industrial wisdom of hundreds of years, as this wisdom has become incorporated into the very values of society and expressed by its institutions. What has been developing for so long elsewhere must be planned and programmed in Africa if this area is to share readily in technological progress. What must be scheduled are not only management training courses, productivity centres, and other well-proven schemes, but concomitant steps must be taken to introduce and to make viable the indirect supports to management, the institutions which supply tools to management, such as basic training in business and office skills,

and through the establishment of various professional organizations which can share the responsibility for leadership and training, such as management associations.

4. A multifocal approach which utilizes the services of specialists over the gamut of administrative and executive practice, which becomes established at many points in the West African social, economic, educational and cultural structure, which utilizes the current pool of managers in positions of leadership in the development of the management profession, and which therefore results in the "institutionalization" of management development practice in the West African culture has been launched in Ghana. In creating a movement which takes on indigenous characteristics and which becomes self-sustaining, many agencies have a role: the Ghanaian colleges and universities, private foundations, United Nations programs, the Ghana Government itself, the technical schools, various expatriate trading companies, and technical assistance programs.

5. The rapid progress of Ghana itself has posed problems for the development of managers. The Ghanaianization of the government ministries and the expatriate trading companies, the increasing need for talented persons to enter the teaching professions, the drain of ambitious bright young men to long-term overseas training, all make heavy demands on what is a relatively small group of persons in managerial capacities or with readiness to become managers. People move up rapidly often without sufficient seasoning, thus also increasing the need for up-grading training programs. This chronic shortage is further complicated by the fact of inefficient utilization of the skills of lower-level Ghanaian workers which results in relatively low output per worker. A circular problem is generated, a scarcity of managerial skill is spread too thin to be able to plan well enough, to supervise adequately, to promote training, in general, to upgrade labour, which in turn restricts the natural development of new additions to the managerial pool. The time of management is taken up with day to day decisions leaving little time or energy to allocate to professional enhancement programs.

6. Government action is needed and one of the first steps taken by the Ghana Government was a Survey of High-Level Manpower undertaken in 1960. This was designed to define the managerial problem by counting and classifying the current human resources available, and then to make recommendations for the conservation and proliferation of management skills in view of the essentially political decisions to embark on an economic scheme of rapid and diversified industrialization.

7. The Survey is now a standard feature of Government and it operates to define the manpower needs of Ghana in general terms, and to reflect changes in needs for training as the economy changes. An important result of the first Survey was a series of recommendations which serves as a co-ordinating point against which to evaluate the adequacy of measures taken and the utility of new programs. Among the recommendations were the following:

"That a Manpower Bureau be established to recommend policies and programmes for development of manpower and to co-ordinate all activities of the Government relating to high-level manpower".

"That a nationwide training programme be undertaken to prepare Ghanaians for administrative and management positions".

"That systematic and continuing programmes be undertaken to build a corps of trained Ghanaian supervisors and to expand on-the-job training, including apprenticeship."

"That a programme of aptitude and achievement tests be developed to select those talented for specialized training in managerial, technical and skilled occupations".

Programs related to these recommendations are in operation or are being implemented.

8. The Manpower Bureau has been established and is in operation with a Ghanaian staff supplemented by additional advisory personnel supplied by the Ford Foundation. This Bureau, working under the State Planning Commission, is an advisory rather than an operating agency, and it has functioned to collect data, to co-ordinate knowledge, to formulate plans and recommend the steps needed to solve various managerial problems. The Bureau maintains close working relationships with other Ghanaian governmental bodies, with university faculties, with colleges, with private industry, and with professional associations. Located in the Planning Commission, its procedures can be sensitive to the changing economic procedure, and in turn, its recommendations are quickly communicable to other planning and operating bodies.

9. In addition to the stimulation of data-gathering surveys which are now well on the way to becoming standard procedures on a regular basis, the Manpower Bureau has demonstrated the effects of direct management courses for senior government officials. There was a two-hour, daily course which ran for four months and was attended by 70 top civil servants. One of the purposes was to create a demand for such training within Government. Follow-ups to such a course, and other courses, are being developed for others within Government to teach, and for other agencies and institutions to offer. In terms of increased demand and increased spread of responsibility for the conduct of such courses, this endeavour has been signally successful.

10. In addition to its advisory function to Government, the Manpower Bureau has recently completed a three months survey of technical and vocational training in the country using a team sent by the Ford Foundation. This will provide a realistic basis for the optimum development of personnel auxiliary to management.

11. Through an additional grant from the Ford Foundation, personnel of the Manpower Bureau have completed four managerial training films. These films portray Ghanaian management problems, are filmed on the local scene, and use Ghanaian actors. These films, which are only the initial films in a series, have been tried out and hold much promise as new and appropriate training material in management programs.

12. Other courses were also directly offered in the areas of supervisory training and basic management training. These courses have also been taken over by others and indeed have expanded. Teaching materials are now being accumulated, case materials adapted to the Ghanaian scene, and a syllabus, are important products of these courses.

13. An experimental human-relations-in-management workshop for 40 top managers drawn from industry as well as government was held for three days to test this kind of contribution. Its initial success led to three one week-long residential courses in 1962 attended by 120 top managers. These workshops stressed personnel development rather than professional content, and were successful far beyond the expectations of the Manpower Bureau. Many of the basic psychological insights gained are to be reinforced as the result of requests by attending managers for follow-up programs within their own organizations later this year.

14. These management workshops were planned and staffed by a large group of interested agencies: universities, colleges, commercial firms, and governmental departments. Support, staff, participants, and other tangible contributions were generously contributed. One of the success of these workshops came from this fact of collaboration between agencies, and from the management leadership stimulated by this collaboration. One can see direct effects of these workshops in turns of new associations and further courses which have come into being.

15. Another kind of activity has been the nourishment of the Ghana Association for the Advancement of Management. This is the first such professional organization with which managers could identify, and through which the cause of management development could be furthered. There are now over 100 members representing both private industry and government; it is a dues collecting, program giving, paper publishing, alert organisation. A small annual grant from the Ford Foundation has helped it over the first years to become its present vigorous self. Among its activities was a three day conference for 125 managers on the subject of Productivity. This was planned under the auspicies of the Management Association and it succeeded at Achimota where it was held. Aside from the timely content of the course, and the gathering of so many managers together to exchange ideas, through the Management Association, the academic world has entered the field of management development.

16. The Management Association, through its sponsorship of regular courses in management, has enlisted the University at Legon in the design and conduct of such courses, illustrating the principle again of enlarging the basis for leadership in the filed, and getting the procedures institutionalized. The Association conducts monthly management seminars open to its members; these are of the presentation discussion type and serve to present timely topics to the members as well as to permit them to explore areas of concern to them.

17. A similar effort is being made by the members of the Manpower Bureau to create an organisation for training directors, following the pattern so successful for the Management Association. This newly formed group has 60 training directors and is scheduling monthly sessions on training techniques, methods and materials. This organization recently designed and held a successful week-long residential course for its members. The training directors have now been invited to affiliate with the Ghana Association for the Advancement of Management, thus broadening the base of both groups.

18. A weekly training film screening is held at which two new films are screened for interested training directors. Film are selected and distributed for use by individual establishments after each showing by the Manpower Bureau. The intention is to demonstrate the utility of films and to establish a training and management film library.

19. The Manpower Bureau continues to offer its services in the assistance of individual establishments to develop training plans and in the improvement of training methods. Demands for this service are increasing.

20. The Manpower Bureau has invited the American Institute for Research which is developing aptitude and achievement tests in Nigeria to extend its work to Ghana. In June of 1962 this program was instituted and it will seek to validate and extend the test procedure already developed in other parts of Africa to Ghana. The intensive training for several Ghanaians as test administrators, test developers, and test interpreters, which will be one consequence of this program, should serve as a powerful tool to Ghanaian management. Four Ghanaian students are now in the U.S.A. under grants from USAID/Ghana where they shall study personnel selection and test development for twelve months. Upon their return they shall fill key spots in the Productivity Centre, the Manpower Bureau, and in the Ministries.

21. Ghana Government Cabinet approval has been secured for the establishment of a Productivity Centre. It is expected that the Ghana Government, the Ford Foundation, USAID/Ghana and the International Labour Organisation will co-operate in financing and staffing the Centre. Education, consultation, experimentation, training, and fact finding will be key features, and, especially important, and Centre is expected to give a focus to many managerial training and consultative activities.

22, In line with its stimulative and promotional functions, the Manpower Bureau has approached a U.S. university with a proposal that they provide a complete management training centre in Ghana. Other negotiations are under way for the establishment of an adult downtown centre to provide basic training in business skills, language skills, in short to provide training for the personnel necessary for effective management.

23. One must mention the Institute of Public Administration, a joint Ghana - U.N. program. Forty graduates are trained each year for subsequent careers in governmental agencies. On the advisory council of the Institute are representatives from many governmental agencies and educational institutions so as to provide multiple contacts with the rest of the management community.

24. In summary, the firm establishment of a national management association, and the experimental and demonstrational programs of the Manpower Bureau appear to have launched several programs which will be self-sustaining and growing and which are expected to increase the managerial manpower pool according to local direction. It is believed the soundest approach to develop new managers out of the local community which is itself providing the primary leadership and stimulation. The outside consultants have therefore maintained roles as guides and as innovators; it is necessary and sufficient that local managerial talent carry on from that point. The evidence is that it can, and that it has.

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L'ERGONOMIE DANS LES PAYS EN VOIE DE DEVELOPPEMENT : APPLICATIONS POSSIBLES ET MESURES PROPRES A EN ASSURER LA DIFFUSION

Par M. LEPLAT,
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de la Main-d'Oeuvre

Les mémoires rédigés à l'intention de la Conférence des Nations Unies sur l'application de la science et de la technique dans l'intérêt des régions peu développées sont des documents de travail. Ils sont publiés tels qu'ils ont été présentés et les assertions et opinions qu'ils contiennent sont celles de leurs auteurs.

NOTES

1. Les mémoires choisis pour être présentés en séance générale pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

4. Préalablement à la Conférence, les mémoires et les résumés ne feront pas l'objet d'une distribution générale mais d'un tirage restreint destiné aux délégations des gouvernements et autres participants officiels. La publication et la distribution générale des actes de la Conférence s'effectueront conformément aux règles et pratiques agréées par le Comité des publications des Nations Unies.

L'ERGONOMIE dans les PAYS en VOIE de DEVELOPPEMENT

APPLICATIONS POSSIBLES et MESURES PROPRES à en

ASSURER la DIFFUSION

L'Ergonomie qui a pour but essentiel l'adaptation du travail à l'homme, par des méthodes scientifiques empruntées aux disciplines traditionnelles, telles que la psychologie et la physiologie, pourra rendre de grands services dans les pays en voie de développement.

L'objet principal de ce rapport est de proposer quelques actions propres à rendre cette discipline la plus efficace possible dans un contexte où elle a encore été peu utilisée. On indiquera tout d'abord quelques techniques propres à révéler les problèmes les plus importants qui se posent sous l'angle de l'adaptation du travail et à établir entre eux une hiérarchie quant à l'urgence de leur solution. Dans un second point et à partir de l'expérience acquise dans les pays techniquement développés, on présentera quelques champs d'application possible et quelques thèmes d'études et de recherches éventuelles. Enfin dans une dernière partie, nous proposerons quelques actions propres à favoriser le développement de l'ergonomie et à accroître son efficacité. En conclusion, nous mentionnerons quelques-uns des bénéfices qu'on peut attendre de cette nouvelle discipline.

Dans ce rapport, une place privilégiée sera donnée aux aspects psychologiques de l'ergonomie, mais il est évident que les aspects physiologiques sont également très importants et que les travaux sur ce point devraient être conduits parallèlement aux précédents.

- I - DEMARCHES EXPLORATOIRES PREALABLES -

Ce premier temps d'une action d'ensemble constituerait l'étape du dépistage et du diagnostic des problèmes. Dans le pays considéré, il y aurait lieu en effet, de voir les secteurs ou les types de travaux réclamant avec le plus d'urgence une intervention. Etant donné la limitation initiale probable des moyens mis en oeuvre, cette phase sera essentielle pour assurer aux efforts la plus grande portée possible.

Il y aurait d'abord lieu de procéder à un inventaire des principaux types d'activités existantes ou en voie de création. Cet inventaire pourrait être fait à l'aide des statistiques disponibles et éventuellement des plans de

développement. A défaut de ces renseignements, une technique de sondage pourrait être utilisée. Cet inventaire de caractère économique pourrait être complété par un tableau aussi complet que possible des caractéristiques générales de la main-d'oeuvre : degré d'acculturation, éventuellement formation reçue.

Il y aurait lieu également de procéder à une enquête sur les difficultés rencontrées actuellement et liées à l'utilisation du matériel et aux conditions de travail. Par exemple, les enquêteurs pourraient se rendre dans des entreprises nouvellement installées et étudier les problèmes posés par l'adaptation de la main-d'oeuvre locale aux différents travaux, ceci au cours de la formation et ultérieurement. Cette enquête serait préparée par une pré-enquête permettant de définir un canevas des principaux points à aborder par les enquêteurs. Ce canevas pourrait évidemment tenir compte déjà des points qui seront soulevés dans la partie - II - Cette investigation faite sur place comporterait des interviews de membres du personnel à tous les niveaux, ouvriers cadres, direction.

Cette enquête ne devrait pas cependant se limiter à l'industrie, mais s'étendre au secteur artisanal et agricole, où elle revêtirait évidemment des modalités différentes.

Les informations recueillies au cours de l'inventaire et de l'enquête permettraient de définir un plan d'intervention et d'études. Il est probable aussi que dès ce moment des recommandations pourraient être faites sur un grand nombre de points.

- II - CHAMPS d'APPLICATION EVENTUELS -

Sans préjuger des résultats des démarches exploratives précédentes, et à partir des connaissances actuelles, on peut suggérer un certain nombre d'actions possibles :

- Secteur agricole : on pourrait analyser des travaux typiques sous l'angle de l'organisation. Ainsi seraient établis des diagrammes comparatifs d'activité qui mettraient notamment en évidence le mode de répartition des tâches, leur organisation dans l'espace et dans le temps, la disposition des installations. La définition d'un processus optimum pourrait alors être proposé.

L'adaptation des matériels et installations, à leur utilisation, serait aussi envisagée.

- Secteur industriel : il semble qu'une attention particulière devrait être apportée à l'utilisation des matériels et installations modernes. Les variables suivantes pourraient être retenues (parmi beaucoup d'autres possibles).

- Symbolisme des dispositifs de signalisation : on cherchera à préciser les difficultés qui peuvent naître dans les activités faisant appel à ce symbolisme, les erreurs qu'il entraîne, les moyens d'éliminer ces difficultés par l'emploi d'un symbolisme plus adapté à la population intéressée.

- Stéréotypes sensori-moteurs et compatibilité entre systèmes de signalisation et de commande.

On cherchera, par exemple, si les stéréotypes supposés par le constructeur des appareils et engins correspondent bien à ceux des ouvriers et les modifications éventuelles à prévoir.

- Distance spatiale et temporelle entre le signal et la réponse. Les dispositifs modernes sont souvent caractérisés par la distance qui s'introduit entre l'action d'un opérateur et le résultat de cette action, qui se produit plus loin, ou n'est qu'indirectement perceptible ou encore n'est perceptible qu'après un certain temps.
On cherchera si certains types de difficultés ne tiennent pas à ces facteurs et on envisagera les moyens de les pallier.

- Conditions de travail : on pourra notamment envisager les effets des horaires de travail, du travail par équipe, des travaux à rythme imposé (comme le travail à la chaîne).

- Conception des bâtiments : il serait intéressant de déterminer les caractéristiques des bâtiments industriels qui concilient les habitudes culturelles du lieu et les exigences de l'organisation et de l'hygiène du travail.

Dans toutes ces actions, on s'efforcera non pas d'appliquer mécaniquement des solutions valables dans d'autres contextes, mais d'utiliser les connaissances acquises, à la découverte de solutions répondant aux problèmes effectifs.

- III - FORMATION de SPECIALISTES -

Cette formation est à envisager à plusieurs niveaux et comporte de nombreux aspects dont nous ne mentionnerons que les plus essentiels :

1 - Formation de spécialistes des différentes branches de l'ergonomie par des stages dans les instituts de pays technologiquement avancés. Des pay-

chologues, médecins, ingénieurs pourraient être ainsi invités à suivre des enseignements d'ergonomie et à faire des stages dans des services spécialisés sur ces questions.

2 - Envoi de spécialistes des différentes branches de l'ergonomie dans les pays en voie de développement en vue de dispenser une formation à des psychologues, médecins, ingénieurs. Cette action pourrait être conduite parallèlement aux actions proposées en - I - et - II - .

3 - Création dans le pays intéressé d'un organisme central qui coordonne les actions entreprises dans le domaine de l'ergonomie, organise la formation et la diffusion des informations. Les fonctions essentielles seraient :

- l'organisation de la documentation : établissement de fichiers, constitution d'une bibliothèque, transmission ou prêt de documents, etc...

- séminaires de formation : l'organisme central serait chargé de réunir des spécialistes et d'organiser des séminaires destinés aux ingénieurs, cadres, exploitants, syndicalistes, représentants patronaux.

- action de conseils auprès des entreprises : l'organisme central disposerait de spécialistes pouvant jouer le rôle de conseil auprès des entreprises pour tous les problèmes d'adaptation du travail.

- réalisation d'études inter-entreprises.

- liaison avec les organismes similaires des pays voisins en vue de mettre en commun les expériences et de coordonner les études et recherches.

- IV - CONCLUSION -

Les bénéfices qui peuvent être attendus de l'ergonomie portent sur plusieurs plans :

- diminution de l'effort et des différentes formes de fatigue,

- accroissement de l'intérêt au travail,

- réduction du temps de formation : les matériels étant mieux adaptés, plus conformes aux possibilités psycho-physiologiques des ouvriers, la formation pourra être beaucoup facilitée et ses résultats grandement améliorés,

- accroissement de la sécurité : l'inadaptation du travail au travailleur est un facteur essentiel dans la genèse des accidents, toute amélioration de l'adaptation entraînera donc une diminution des risques d'accidents,

- accroissement de productivité : l'ensemble des avantages précédents conduit à un accroissement de la productivité, qui a l'avantage d'être obtenu en même temps que la satisfaction de l'ouvrier.

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